



ARPA-E's 37 Projects Selected From Funding Opportunity Announcement #1

Project Title: Electroville: High Amperage Energy Storage Device-Energy for the Neighborhood
Organization: Massachusetts Institute of Technology
Funding Amount: \$6,949,584
Website: <http://web.mit.edu/dsadoway/www/>

Brief Description of Project

Large-scale storage of electrical energy is a huge problem in an array of fields from load leveling of power grids to providing uninterruptible backup power for manufacturing facilities and hospitals. Furthermore, large-scale energy storage is a crucial technology to enable the use of renewables as a means of reliably meeting the electricity needs of our population by providing a large scale (MWh on a small footprint), rapid recharge (MW-rate over a period of hours) charge-storage capability. While there have been striking improvements in batteries in recent decades, there is no technology capable of meeting the demanding performance requirements of this demanding application. These include service lifetime spanning many years and thousands of cycles at deep depth of discharge (>80%), very high current rates, and very low cost (<\$50/kWh). The deliverables will be the design parameters as well as a working prototype that can store and deliver energy on the order of 5-kWh. The device will use cheap and domestically abundant materials and is expected to attain unprecedented current density and lifespan at an acceptably low cost. We call this project "*Electroville*."

Why ARPA-E Funding and Not Private Capital

As a research university, the ARPA-E funding has allowed us to pursue the development of the technology on campus and take risks that normal research funding does not support. We will be able to do this work without having to give up equity to investors and build value so that the inventors will have a higher value technology. We have the ability to demonstrate scalability and commercial viability with no dilution of ownership stake.

Uniqueness/Benefits of Technology

Other attempts to develop large-scale energy storage have taken the approach of redesigning an existing battery so as to endow it with greater current carrying capability. In contrast, the PI has taken the approach of starting with a device that intrinsically has giant current carrying capability and modifying it so as to endow it with the ability to store charge. Specifically, the idea is to convert a metal-producing, industrial-scale electrolysis cell into a battery.

Addressable Market & Potential Customers

The market applications for a grid level storage technology that is "better than Li-ion performance, cheaper than lead-acid" are many. It is unclear presently what the best first market for the technology, but utility level customers that want to include renewable generation into their mix at levels higher than 20% are an obvious target. This is a multiple MWh product with scaling based on the penetration of wind and solar installations.

Key Team Member Bios

Donald R. Sadoway is the John F. Elliott Professor of Materials Chemistry at MIT. Professor Sadoway has been active in two technical domains relevant to the research: (1) electrochemical processing of metals; and (2) advanced materials for rechargeable batteries. In domain (1) he has 30 years of experience in the fundamental and applied electrochemistry that supports the electrolytic production of a number of critical metals. In domain (2) Professor Sadoway has worked on a variety of materials issues for lithium-ion batteries. Most significantly he is the co-inventor of a class of polymers that can serve as both the electrolyte & the separator in a lithium battery.



For inquiries, contact:

Email:

ARPA-E@hq.doe.gov

Website:

<http://arpa-e.energy.gov/>

Miscellaneous

This technology is based on aluminum smelter technology and consequently tends to have a scale-down problem instead of a scale-up problem. So, the opportunity to scale-up rapidly is a boon for our technology's successful commercialization.

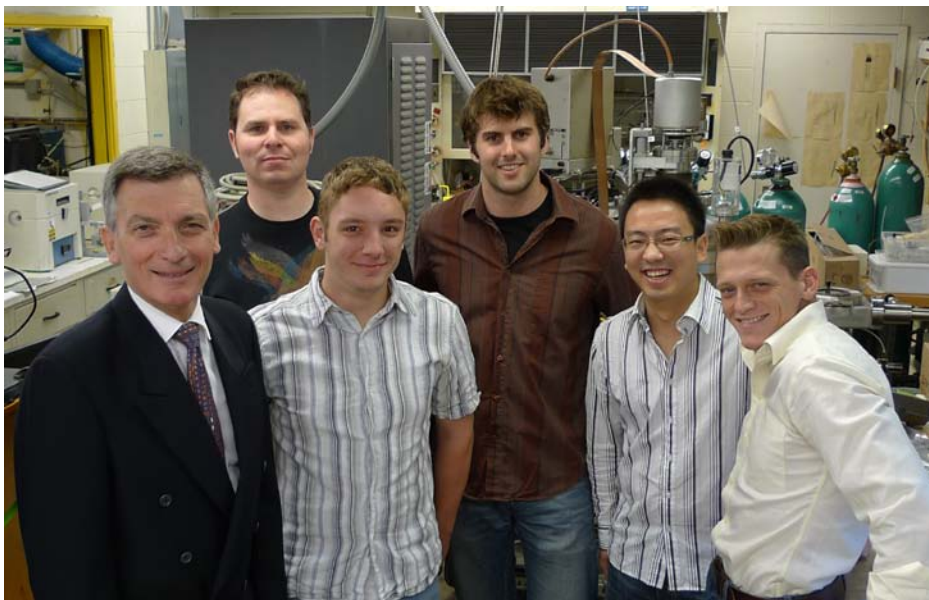
Testimonials

The funding from ARPA-E is going to help MIT accelerate the development of our technology much more quickly than normally would be possible. MIT will be able to make imprudent leaps in scaling up due to the vision of our ARPA-E program manager.

The support that we have gotten from ARPA-E has already helped us to refine MIT's project planning and focus our efforts on very aggressive yet achievable goals.

Everyone at ARPA-E has been top notch and a pleasure to work with as collaborators.

Schematics/Photos of Technology or Personnel



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